WORK PLAN FOR ESTABLISHMENT OF A SURVEY CONTROL NET AND SURVEY OF WASTE STORAGE AREA DIKES AT THE FEED MATERIALS PRODUCTION CENTER FERNALD, OHIO MARCH 1991

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MARCH 1991

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WORK PLAN FOR ESTABLISHMENT OF A SURVEY CONTROL NET AND SURVEY OF WASTE STORAGE AREA DIKES

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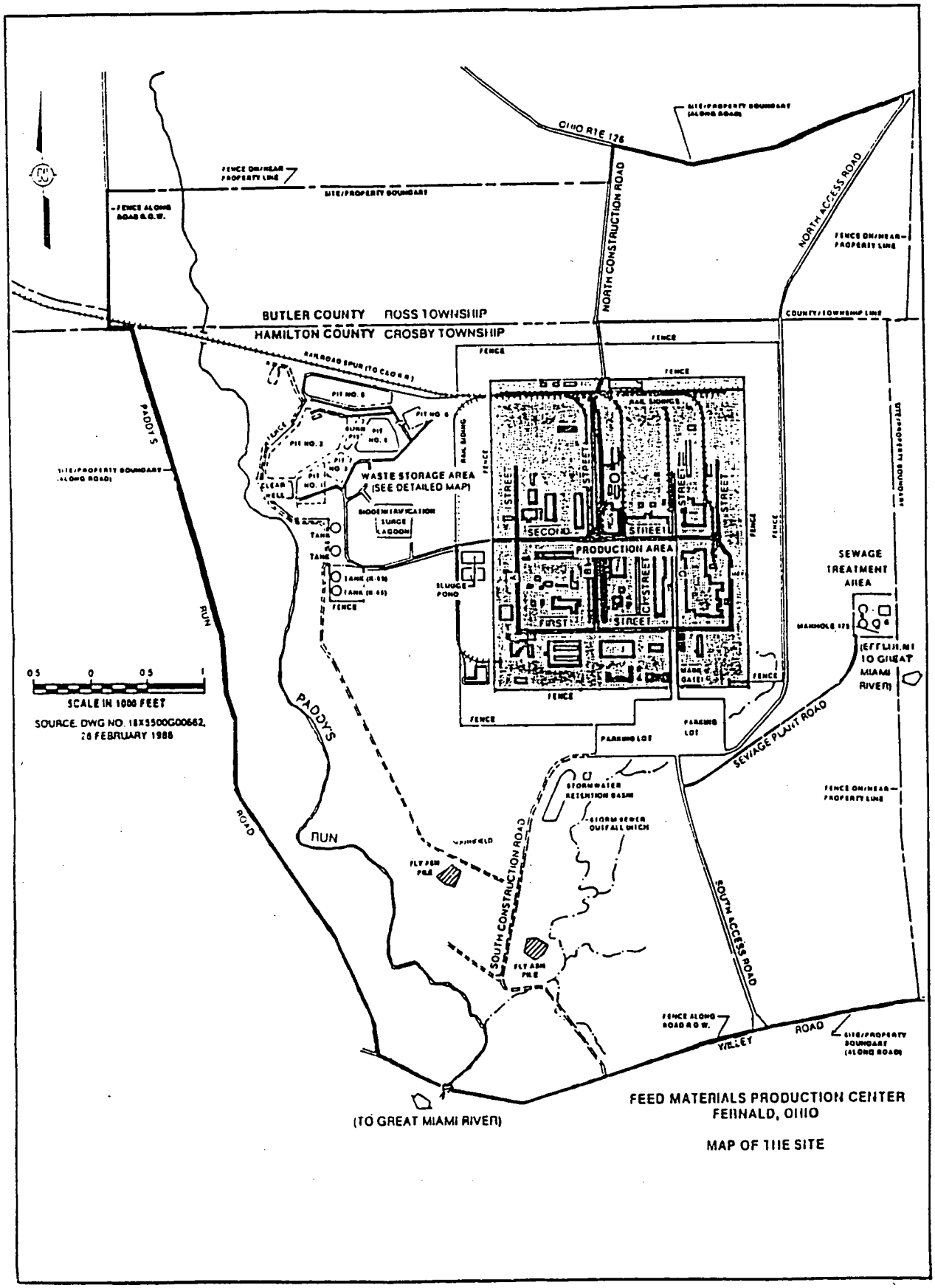
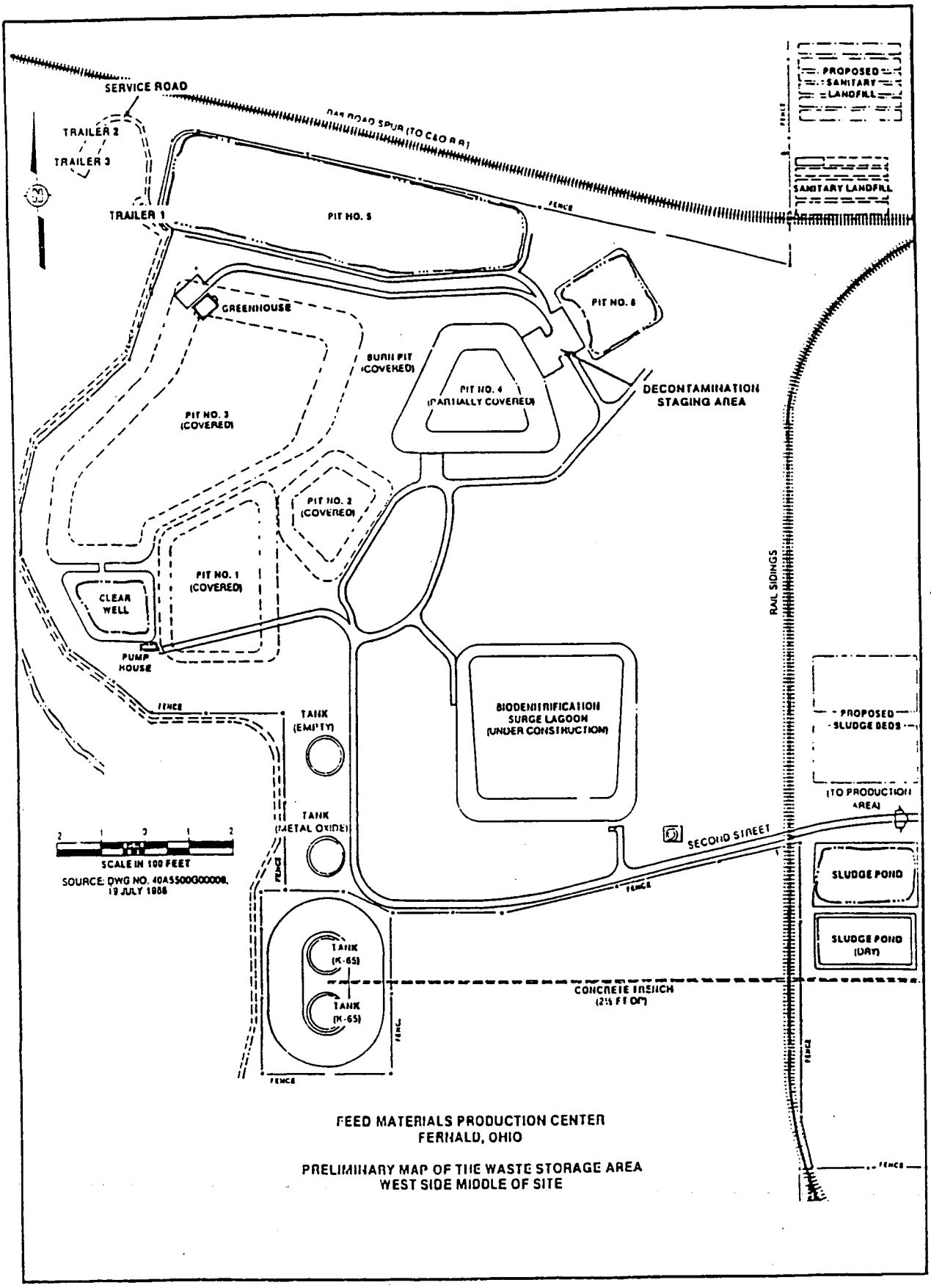


FIGURE 1
FEED MATERIALS PRODUCTIONS CENTER SITE, FERNALD, OHIO



FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

PRELIMINARY MAP OF THE WASTE STORAGE AREA
WEST SIDE MIDDLE OF SITE

FIGURE 2
MAP OF WASTE STORAGE AREA

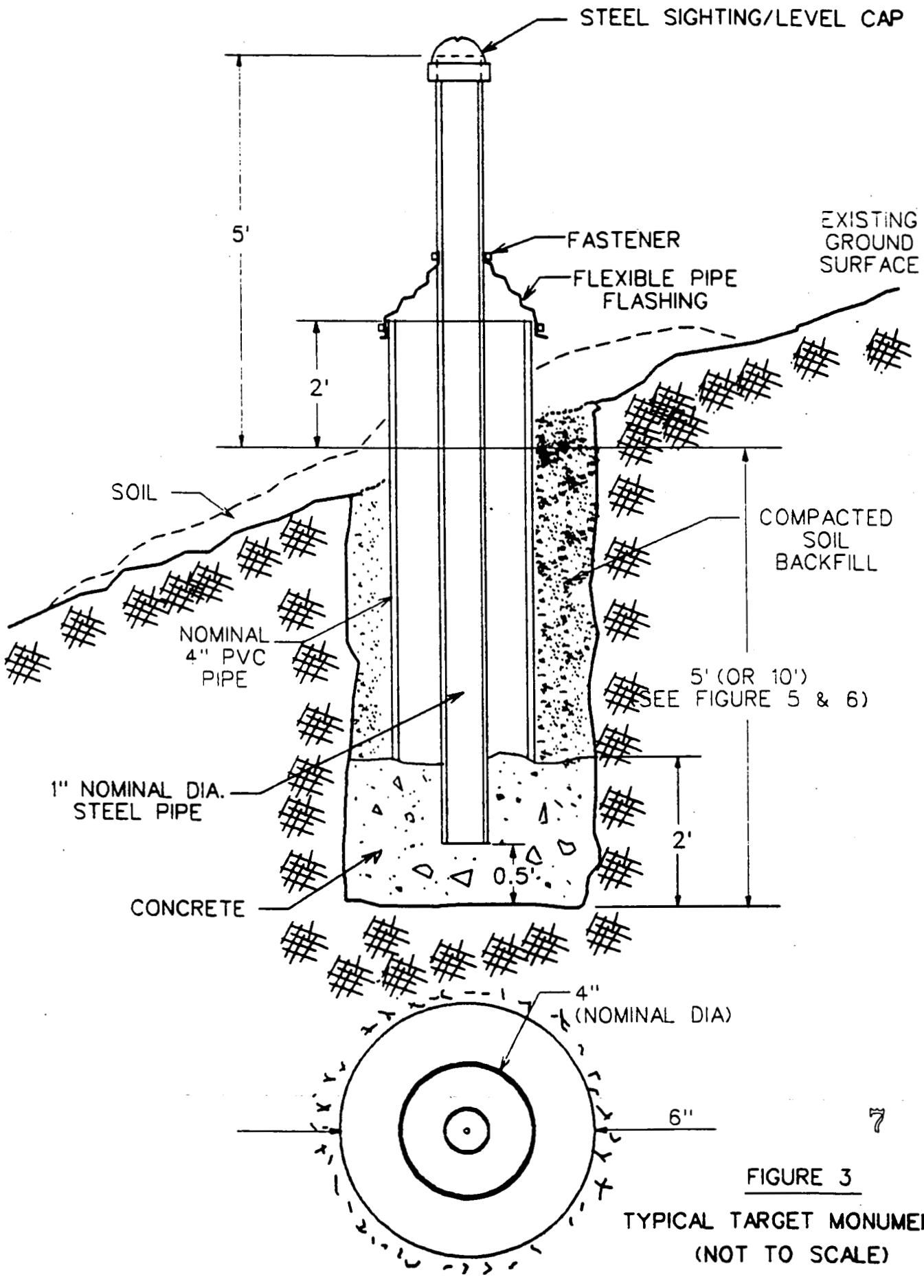
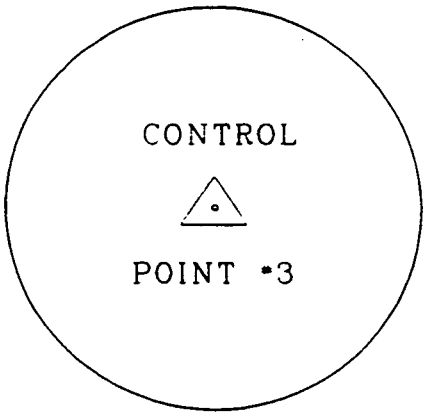


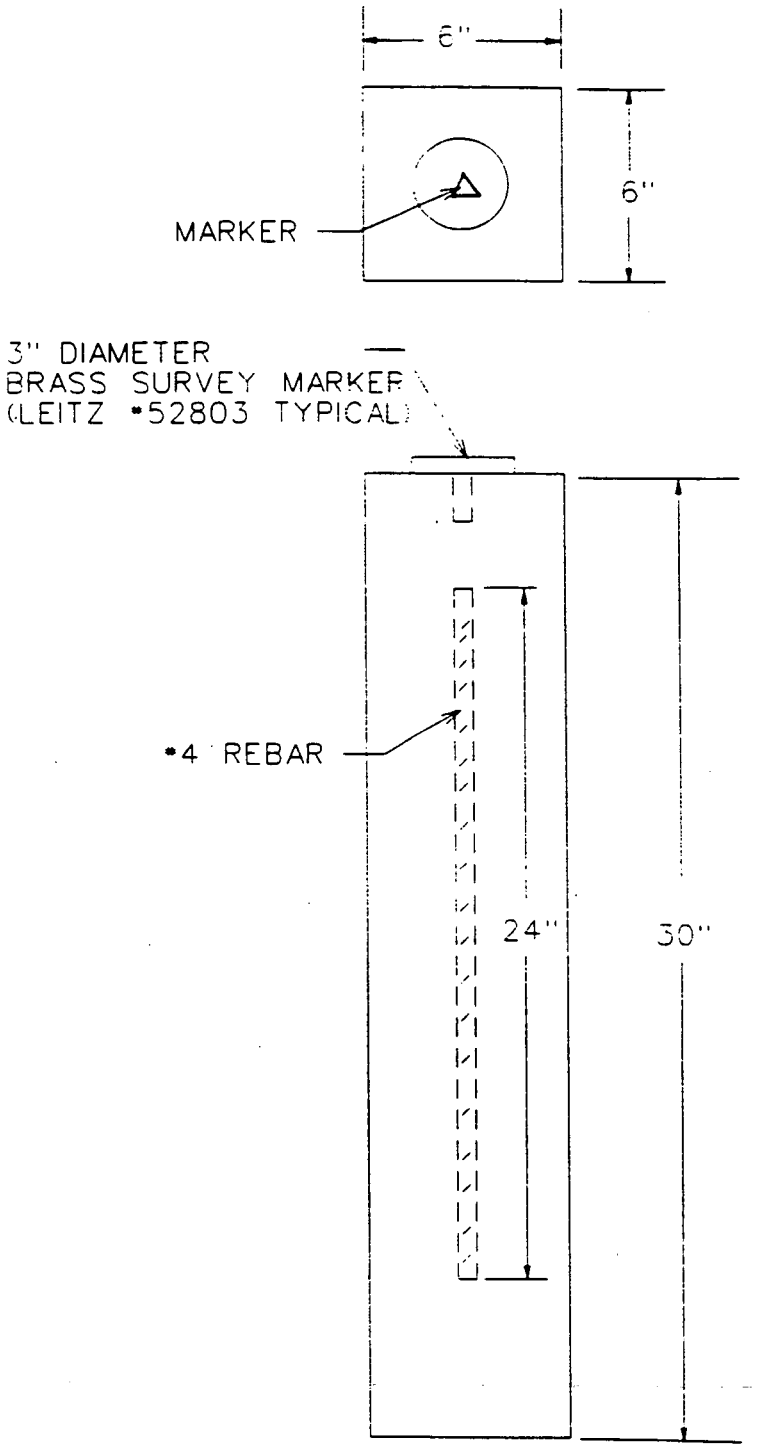
FIGURE 3

TYPICAL TARGET MONUMENT

(NOT TO SCALE)



BRASS MARKER DETAIL



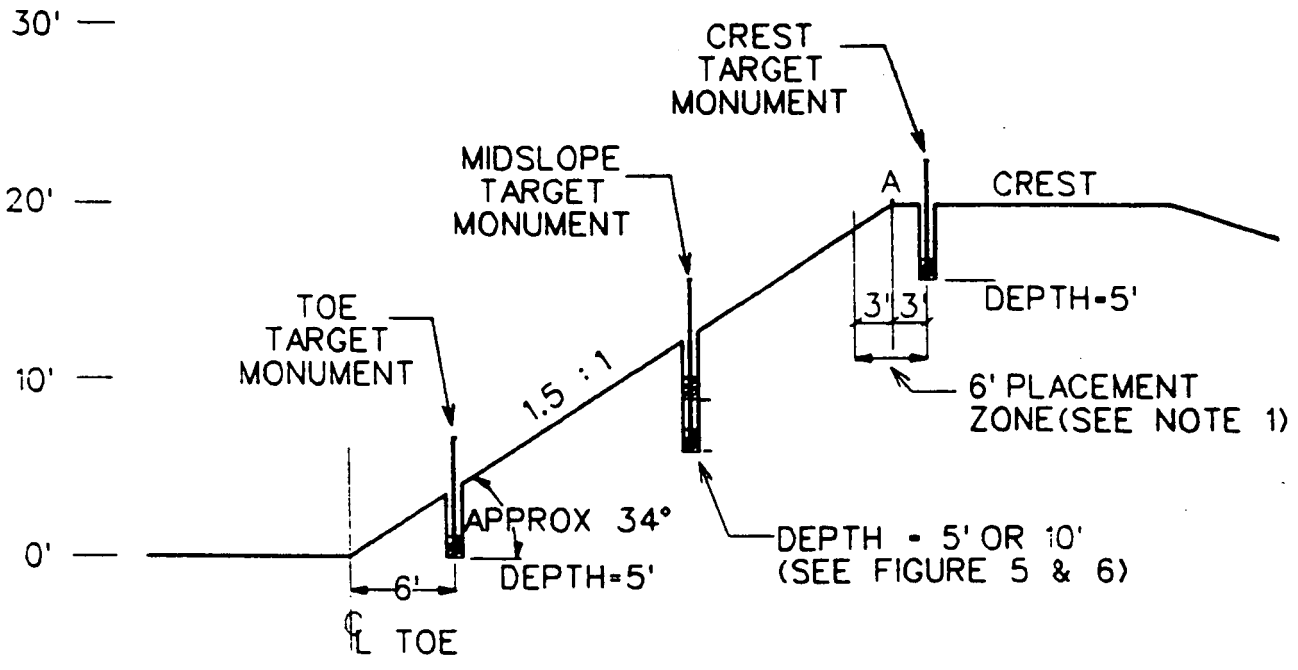
PRECAST CONCRETE
MONUMENT

FIGURE 4

TYPICAL CONTROL MONUMENT

(NOT TO SCALE)

FIGURE 7 TYPICAL CROSS SECTION OF NORTH DIKE OF WASTE PIT 5 SHOWING TARGET MONUMENT LOCATION AND DEPTH



(NOT TO SCALE)

NOTES:

1. CREST TARGET MONUMENT SHALL BE PLACED WITHIN 3 FEET OF POINT "A".
2. MIDSLOPE TARGET MONUMENT SHALL BE PLACED APPROXIMATELY $\frac{1}{2}$ THE DISTANCE BETWEEN THE TOE TARGET MONUMENT AND THE CREST TARGET MONUMENT.
3. SEE FIGURES 5 & 6 FOR DEPTHS OF MIDSLOPE TARGET MONUMENTS.

SECTION 1

INTRODUCTION

1.1 Background

Operable Unit 1 (OU-1) is one of the five Operable Units under the Environmental Remedial Action (ERA) Project at the Feed Materials Production Center (FMPC). OU-1 consists of Waste Pits 1-6, the Burn Pit, and the Clearwell. The area covered by all components of OU-1 is roughly 25 acres. The Clearwell is active with all remaining components inactive. Waste Pits 1-4 and Burn Pit are covered with fill. Waste Pits 5 and 6 and the Clearwell are exposed.

This work plan has been prepared in support of the Project Plan for Project Order Number 11, dated December 20, 1990. The requirements of Project Order Number 11 are to evaluate the structural stability of earthen dikes of Waste Pits 3, 5, and the Clearwell. The technical specifications attachment describes the requirements for establishment of a control net associated with the waste storage area dikes and subsequent surveys to monitor potential dike movement. The surveys will provide a means to observe and record any movement of soil outside the range of frost action. Additionally, the surveys will provide a means to accomplish long term monitoring of the dikes in order to warn site personnel if emergency action needs to be taken in the future.

1.2 Objective and Approach

1.2.1 Objectives

The objectives of the technical specifications attachment are as follows:

1) Provide requirements for establishing a survey control net to monitor waste storage area dikes for movement

2) Provide requirements for establishing permanent waste storage area dike target monuments

3) Provide requirements for establishing control monuments outside the zone of possible dike movement

4) Provide requirements for control net surveys.

1.2.2 Approach

A survey control net will be established for the monitoring of potential movement of waste storage area dikes. Permanent target monuments will be installed at various locations along specified waste storage area dikes. These monuments will be founded at a depth as to minimize movement due to shrinking/swelling of clay dike material and freezing/thawing action. Additionally, dike target monuments will be designed to eliminate the effects of temperature changes and the potential for mechanical damage. Other control monuments will be established well outside the zone of possible dike movement to provide stable reference points from which the waste storage area dikes can be monitored.

After establishing the survey control net, a horizontal and vertical control survey will be performed to establish initial locations of all monuments. Subsequent periodic horizontal and vertical control surveys will be performed to monitor the dikes for movement. The FMPC Coordinate System will be used for horizontal control. Vertical control will be tied to the National Geodetic Vertical Datum.

SECTION 2

SITE DESCRIPTION

2.1 Site Location

The Waste Storage Area is located at the FMPC site near Fernald, Ohio. United States Geological Survey (USGS) 7.5 Minute Topographic Map, Shandon Quadrangle, Ohio shows the FMPC site and the surrounding area. Figure 1 shows the FMPC site.

2.2 Description of Waste Storage Pit Area

Six waste storage pits are located in a controlled, fenced Waste Storage Area west of the FMPC production facility. These pits comprise the principal waste storage units at the FMPC (See Figure 2). With the exception of Waste Pits 3 and 5, all pits received only dry wastes. Typical wastes deposited in the pits included some thorium and low-level radioactive wastes associated with uranium metals production as well as some other materials such as asbestos, barium chloride salt, scrap and trash.

The dikes of concern are associated with Waste Pit 3, Waste Pit 5, and the Clearwell.

2.2.1 Waste Pit 3

Waste Pit 3, constructed into a clay lens with clay-lined walls, operated as a settling basin for liquid wastes between 1959 and 1968. Waste Pit 3 also received dry wastes between 1975 and 1977, at which time it was closed and covered with a clean fill cover. The volume of Waste Pit 3 is approximately 227,000 cubic yards (cy).

2.2.2 Waste Pit 5

Waste Pit 5, which was placed in service in 1968, was designed and operated until 1983 as a surface impoundment receiving high solids-bearing (slurried) waste streams and supernatant from the general sump wastewater treatment system. Waste Pit 5 is lined with a 60-mil thick membrane liner. The higher solids-bearing wastes directed to Waste Pit 5 were primarily waste materials generated from FMPC refinery operations (neutralized raffinates). Settleable solids were removed from these waste streams in Waste Pit 5 by precipitation. In 1983, when the holding capacity of Waste Pit 5 was nearly exhausted, all high solids-bearing wastewater from the general sump treatment were redirected

to alternate on-site treatment systems. From 1983 to 1987, Waste Pit 5 received only low solids-bearing wastewater from the general sump treatment operation. The practice of transferring clarified general sump wastewater was continued until 1987 to take advantage of Waste Pit 5's remaining solids removal capacity. The volume of Waste Pit 5 is approximately 102,000 cy.

2.3 Clearwell

The Clearwell receives surface run-off from the waste storage area. It is used as a settling basin prior to discharge to the Great Miami River via the FMPC National Pollutant Discharge System (NPDES) discharge point. It is anticipated that a significant amount of uranium-bearing, settled solids is contained in the basin.

2.4 Description of Storage Area Dikes to be Monitored

Permanent target monuments will be installed in the following dikes to monitor for dike movement.

2.4.1 North Dike of Waste Pit 5

The north dike of Waste Pit 5 is approximately 820 feet long and 20 feet high. The slope is approximately 1.5 (run) to 1 (rise) expressed 1.5:1. A chain link security fence borders the dike at the crest. The dike has approximately 10 feet of level berm at the crest (inside of fence). The pit is approximately 30 feet deep with a design slope of approximately 2.5:1. The pit is lined with a synthetic liner. The pit is almost completely filled, with approximately 1-2 feet of the liner visible at the perimeter. A drainage ditch at the toe of the slope runs west to Paddy's Run. A railway embankment runs parallel to the dike north of the drainage ditch. The railway embankment is approximately 10 feet high with a slope of approximately 1.5:1.

2.4.2 West Dike of Waste Pit 5

The west dike of Waste Pit 5 is approximately 240 feet long and 12 to 15 feet high. The slope is approximately 1.5:1.

2.4.3 Southwest Dike Corner of Waste Pit 5

The southwest corner of the Waste Pit 5 dike was selected for monitoring as a result of a Parsons (S. Versluis, K. Ernst) field observation February 27, 1991. The vegetation was noticeably different, being more conducive to moist environments. Also, indications of the presence of burrowing animals in this area were noted.

2.4.4 West Dike of Waste Pit 3

The west dike of Waste Pit 3 is approximately 800 feet long and 20 feet high. The slope is approximately 1.5:1 to 1.25:1. Much of the slope is covered with trees and brush. An access road runs parallel to the slope at the toe. Waste Pit 3 has been covered with clean fill.

2.4.5 West Dike of Clearwell

The west dike of the Clearwell is approximately 200 feet long and 20 feet high. The slope is approximately 1.5:1.

Target monument dimensions, materials, locations, depths, and installation procedures are specified in Attachment A.

2.5 Drawings

2.5.1 Topography Drawings

The following drawings show the topography of the waste pit dikes and surrounding area:

1) Woolpert Consultants Dwg. 75-5500-G-00112, Rev 0; 12/4/88.

2) Woolpert Consultants Dwg. 75-5500-G-00113, Rev 0; 12/4/88.

2.5.2 Benchmarks

The following drawing shows the location of three benchmarks in the vicinity of Waste Pit 4:

1) Lockwood Green Dwg. 40A-1900-G-0022-C003 (Rev. 0); 04/26/88
(Note: The coordinates of Benchmark No.1 have been confirmed by Westinghouse Materials Company of Ohio (WMCO). The southern coordinate of Benchmark No. 1 has been modified to S1184.97. The elevation of Benchmark No. 1 has not been confirmed. The locations and elevations of Benchmark Nos. 2 and 9 have been confirmed by WMCO.)

2.6 Coordinate Systems

2.6.1 FMPC Coordinate System

The FMPC site has an established coordinate system. The origin of the FMPC Coordinate System is at State of Ohio Coordinate point N 482,784.678, E 1,376,578.563. The FMPC North is rotated 1° 34′ 04" (1.5678°) clockwise of State of Ohio North. Coordinates of all monuments and other control points associated with the waste pit dike control net will be referenced to the FMPC Coordinate System.

2.6.2 National Geodetic Vertical Datum

Elevations of all monuments and other control points associated with the waste pit dike control net will be referenced to the National Geodetic Vertical Datum.

SECTION 3

TARGET MONUMENTS

A typical target monument is shown in Figure 3.

3.1 Target Monument Locations

Selection of target monument location was based on the following considerations:

1) Target monuments will be located on dike areas that pose the greatest likelihood of movement. Waste Pit 5 contains uncovered liquids; and if the slope were to fail, it has potentially direct drainage to Paddy's Run via the drainage ditch at the toe of the north dike. Therefore, the north dike of Waste Pit 5 will be extensively monumented for monitoring. Waste pit 3, which has been dormant and covered since 1977, has a less direct drainage path to Paddy's run than Waste Pit 5. Therefore the west dike of Waste Pit 3 will be less extensively monumented than Waste Pit 5. The Clearwell, which is smaller than Pits 3 and 5, requires target locations on the west dike.

2) Target monuments will be established at the southwest corner of Waste Pit 5 dike for reasons discussed in Section 2.4.3.

3) Target monuments will be placed in a line of three at various cross sections of the dike. One target will be located at the crest on the dike, a second at mid-slope, and the third near the toe. Placement of the target monuments in this configuration allows for a more reliable evaluation of potential slope movement, if deflection of a target monument is detected.

3.2 Target Monument Depth

Selection of target monument base depths were determined to account for the following:

1) Target monuments will be placed to detect movement of the dike at the elevation at which they are founded.

2) Target monument foundations will be placed at a depth such to minimize movement due to freeze/thaw action or shrink/swell of clay materials.

3) Depth selection was based on an assumed circular slope failure wedge. Scoping calculations (simplified Bishop Method) were used to estimate a deep and shallow failure surface for target base placement.

SECTION 4

CONTROL MONUMENTS

A typical control monument is shown in Figure 4.

4.1 Control Monument Locations

Control monuments will provide a stable reference point and shall be located well outside the zone of potential dike movement.

Locations to best facilitate sighting and triangulation of the target monuments should also be a consideration for control monument placement.

4.2 Control Monument Depth

The base of the control monument shall be placed 30 inches below the existing ground surface elevation to eliminate potential movement due to frost action.

ATTACHMENT A

TECHNICAL SPECIFICATIONS

A.1 Scope of Work

The work covered under the technical specifications consists of furnishing all equipment labor and performing all work necessary for the establishment and survey of a survey control net of waste storage area dikes of Operable Unit 1 (OU-1) of the Feed Materials Production Center (FMPC), Fernald, Ohio. The work includes furnishing of all engineering necessary to obtain the required data and to perform all necessary calculations. The work shall include, but is not limited to, the following:

1) Determine location and condition of nearest official benchmarks and control points to be used

2) Establish permanent target monuments on Waste Storage Pits 3, 5, and Clearwell dikes

3) Establish permanent control monuments in areas located outside of potential dike movement

4) Establish horizontal and vertical control

5) Perform periodic horizontal and vertical control surveys to monitor waste pit dikes for movement

6) Submit records, all data and calculations as specified.

A.2 Survey Technical Specifications

A.2.1 Target Monument Post-Installation Survey

A.2.1.1 Horizontal Control, Accuracy, and Precision

Following the establishment of control net monumentation, horizontal coordinates shall be established utilizing triangulation, trilateration, traverse, or a combination of the three.

All coordinates established will be referenced to the FMPC Coordinate System. Horizontal control shall maintain second order, Class II accuracy. Survey equipment used shall be capable of producing second order, Class II surveys.

A.2.1.2 Vertical Control, Accuracy, and Precision

Following the establishment of control net monumentation, perform a level survey to two points at the site using the nearest official datum to establish two vertical benchmarks at the site and tie these into horizontal reference points (control and target monuments).

All elevations shall be referenced to the National Geodetic Vertical Datum.

Vertical Control shall maintain second order, Class II accuracy. Survey equipment used shall be capable of producing second order, Class II surveys.

A.2.1.3 Survey Records

All field work shall be recorded in duplicating field books with pages delivered in ring binders. Notebooks shall be annotated on the inside cover to show county, location, name of responsible surveyor, and all other pertinent data as required by the WMCO Engineer.

The Surveyor shall furnish the WMCO Engineer with complete information, as subsequently listed, on all monumented control points established and/or recovered by the Surveyor.

1) Information required on control points established by the Surveyor is as follows:

   (1) Designation of station.

   (2) Position (if horizontal control point). Plane coordinate values based on FMPC Coordinate System shall be given.

   (3) Elevation (if vertical control point).

   (4) Establishing agency (name of engineer who established the control).

   (5) Date of establishment.

   (6) A complete description of the nature and location of the point, which shall include a sketch of the location of the point, and ties to three (3) permanent reference points.

2) Information required on existing points recovered by the Surveyor is as follows: 1156

(1) General condition of the mark.

(2) Adequacy of the present condition.

(3) Establishing agency.

(4) Exact letters and numbers stamped on (not cast in) the mark.

(5) Amended description and/or additional ties executed, and sketch of location, where necessary, to facilitate future recovery.

(6) Date of recovery and recovering agency.

A.2.1.4 Plotting of Survey Information

1) Scale 1" = 50′ (The Surveyor shall verify with the WMCO Engineer the orientation and subdivision of drawings prior to drafting of field data.)

2) Contour interval = 1.0′

3) 0.1′ accuracy

4) All drawings must be signed and certified by and bear the seal of the Surveyor as a Registered Land Surveyor in the State of Ohio.

5) The Surveyor shall furnish one mylar; or if CAD capabilities are utilized, the Surveyor shall furnish one CAD file (tape or diskette) which reflects the finished drawing(s) in lieu of the mylar; and three blueline prints of drawing(s).

A.2.2 Verification Surveys

Verification surveys will be performed periodically to determine the coordinates and elevation of the target monuments. Results of the surveys will be used to evaluate potential slope movement.

A.2.2.1 Type

Horizontal and Vertical control verification surveys of the control net shall be performed as described in Attachment A.2.1.1 and A.2.1.2.

A.2.2.2 Frequency and Duration

Verification surveys of the control net shall be performed once a week for a period of four (4) weeks following the post-installation survey (four verification surveys). If a slope monitoring monument(s) shows total displacement in any plane exceeding the limits of second order, Class II survey measurement error and cannot be explained by other geotechnical considerations, another verification survey shall be performed as soon as possible, not to exceed 48 hours.

After the four-week period, the WMCO Engineer will establish survey frequency, with the minimum frequency being monthly for a duration of three (3) months. If corrective action is undertaken at any time during the monitoring period, the WMCO Engineer will set monitoring frequency and duration during the corrective action period.

After the 3-month period, the WMCO Engineer shall establish any long-term survey requirements.

If displacements of one one-hundredth (0.01) of a foot or greater are verified, daily surveys shall be performed to monitor movement. The WMCO Engineer shall be informed of all movements of one one-hundredth (0.01) of a foot or greater.

A.2.2.3 Survey Records

Verification survey records shall be maintained per Attachment A.2.1.3.

A.2.2.4 Plotting of Survey Records

Plotting of verification survey records shall be per Attachment A.2.1.4.

A.3 Target Monument Technical Specifications

A.3.1 Target Monument Description

A.3.1.1 Design

Design of a typical target monument is shown on Figure 3.

A.3.1.2 Materials

The following materials will be utilized in construction of target monuments shown in Figure 3:

1)	Steel pipe:	1 inch nominal diameter, ASTM A-53, Grade A, extra strong (XS) steel pipe. (Galvanized (ASTM A-120) or stainless (ASTM A-304) steel may be used as an alternative to increase corrosion resistance.)
2)	Concrete:	FMPC Mix No. 2 as specified in FMPC "General Design Criteria Manual" (RM-FMPC-0001).
3)	PVC pipe:	4-inch nominal diameter, schedule 40, ASTM D-1784 cell classification 12454-B.
4)	Sighting/Level cap	Manufactured of same material as steel pipe to minimize corrosion.
5)	Pipe Flashing:	Flexible rubber compounded or synthetic material; waterproof, resistant to ozone and ultra-violet light. Flashing shall be compatible to steel and PVC pipes. Continuous service temperature range: -20 degrees F to +150 degrees F.

A.3.1.3 Identification

Each target monument will be identified utilizing an alphanumeric coding system. A hyphen (-) follows the first two characters of the alphanumeric code.

First character: "T" (for Target).

Second character: identifies waste pit number (or "C" for Clearwell).

Third character: identifies the target monument number associated with a waste pit.

For example, the designation "T5-3" identifies target monument number three located on the dike of Waste Pit 5. "TC-3" identifies target monument number three located on the dike of the Clearwell.

All monitoring monuments will be identified by visible permanent markings attached securely to the monument.

A.3.2 Installation

A.3.2.1 Locations

Twenty-four (24) permanent target monuments will be installed. Twelve (12) will be installed on the north dike of Waste Pit 5, with another three (3) located at the southwest corner of Waste Pit 5. Six (6) will be installed on the west dike of Waste Pit 3, and three (3) will be installed on the west dike of the Clearwell.

Target monuments will be installed at locations shown on Figure 5, 6, and 7. After installation, a post-installation control survey will be performed to establish the (FMPC) coordinates and elevations of each target monument (See Attachment A.2.1).

A.3.2.2 Depth

The depth of each target monument foundation below the existing ground surface elevation is listed in Figures 5 and 6. Foundation depths are shown schematically in Figure 7.

A.3.2.3 Procedure

The procedure for installing permanent target monuments in dikes shall be used in conjunction with the Health and Safety Plan discussed in Attachment B. Construction procedures shall meet the requirements of the FMPC "General Design Criteria Manual" (RM-FMPC-0001). Measurements shall be taken during target monument construction to ensure that the steel pipe is installed plumb. The length (measured to one-sixteenth of an inch) of the steel rods used to construct each target monument shall be recorded and provided to the WMCO Engineer.

A.4 Control Monument Technical Specifications

A.4.1 Control Monument Description

A.4.1.1 Design

Figure 4 shows a typical control monument to be used in the establishment of the control net.

A.4.1.2 Materials

Control monuments may be either prefabricated or constructed. Concrete shall meet the requirements of FMPC Mix No. 2. Construction shall meet the requirements of Appendix B of the FMPC General Design Criteria Manual (RM-FMPC-001).

A.4.1.3 Identification

All control monuments will be identified by visible permanent markings attached securely to the monument.

A.4.2 Installation

A.4.2.1 Locations

Control monuments shall be located well outside the zone of potential dike movement. A location to best facilitate sighting and triangulation of the target monuments should be a consideration for control monument placement.

A.4.2.2 Depth

The control monument base shall be placed 30 inches below the existing ground surface.

A.4.2.3 Procedure

The procedure for installing permanent control monuments shall be used in conjunction with the Health and Safety Plan discussed in Attachment B.

ATTACHMENT B

HEALTH AND SAFETY

Health and safety precautions and considerations for monument placement and control net survey are addressed in a Health and Safety Plan prepared by Westinghouse Materials Company of Ohio (WMCO).

ATTACHMENT C

SCHEDULE

C.1 Frequency of Monitoring

The target monument post-installation survey described in Attachment A.2.1 shall be completed within two weeks of final monument installation.

Verification surveys shall be scheduled per Attachment A.2.2.2.

C.2 Conditions to Warrant More Frequent Monitoring

Total displacements in any plane greater than one-one hundredth (0.01) of a foot shall prompt daily surveys per Attachment A.2.2.2.

Observed movement trends witnessed by the cumulative directional displacement of two consecutive surveys exceeding one-one hundredth (0.01) of a foot may warrant more frequent surveys as specified by the WMCO Engineer.

ATTACHMENT D

QUALITY ASSURANCE/QUALITY CONTROL

FMPC 2139 "Quality Assurance Plan" shall be utilized in all activities associated with control net establishment and survey.

All surveys shall maintain second order, Class II accuracy. Survey equipment used shall be capable of producing second order, Class II surveys.

Records shall be maintained per Attachment A.2.1.3.